ARI Contractor Report 96-84

Database Functional Description

Jack A. Briscoe
BDM Federal, Inc.

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United States Army Research Institute for the Behavioral and Social Sciences

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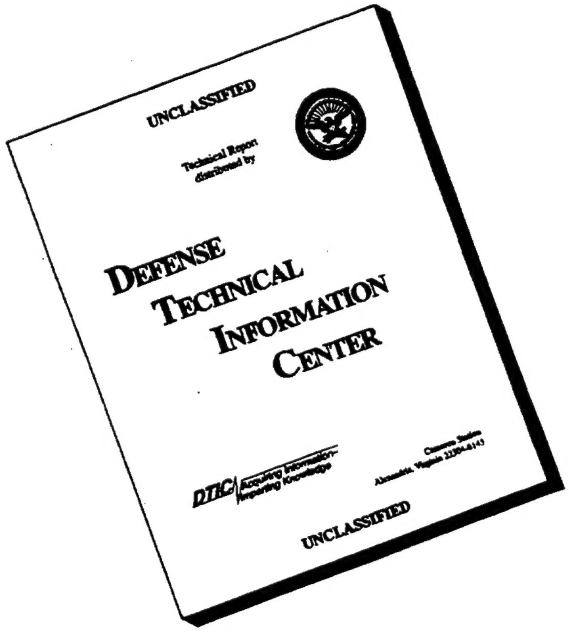

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This project focuses on realizing a near-term practical impact on the training environment in USAREUR, through efforts to complement current training assessment procedures. By installing new SIMNET-based tools and integrating performance data from home station/training area, SIMNET, and CMTC arenas, the effort is designed to benefit trainers, researchers, training managers, and training developers. The new tools and data base are intended to provide a more objective basis for assessing unit training performance, which will enable greater standardization within the USAREUR training community. The project's scope encompasses initialization efforts extending into FY96, resulting in a foundation to sustain continuing operations as future resources become available. Ultimately the project's benefits can be expected to result in more effective USAREUR training programs, and consequently enhanced combat readiness of USAREUR forces.

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DATABASE FUNCTIONAL DESCRIPTION

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1.0 INTRODUCTION

1.1 Background

Senior leaders and planners in the Department of Defense (DoD) and Department of the Army face difficult challenges in planning and resourcing training for combat readiness. Ensuring adequate resources demands information on the cost and relative effectiveness of various options for training large units and their staff elements. Today's training environment is extremely complex (US Army, 1988, 1990) and includes large-scale Distributed Interactive Simulations (DIS) such as Simulation Networking (SIMNET; see Alluisi, 1991) and the Close Combat Tactical Trainer (CCTT). The complexity of modern training systems makes it very difficult to evaluate the training effectiveness of an individual training system in isolation (Boldovici & Bessemer, 1994). Because of the complexity, military trainers will require multiple training cycles to learn how to achieve the maximum potential of the entire system. Consequently, gauging the contributions of the various training aids, devices, simulations, and simulators (TADSS) along with field training to unit proficiency requires evaluating TADSS performance as part of the whole training environment.

With the expanding role of DIS technologies in military training, continuous feedback is needed to identify, implement, and evaluate improvements throughout the life cycle of a DIS-based training system. To obtain this feedback, research in the contributions of DIS systems to total force performance must be planned and implemented (e.g., Burnside, 1990; Drucker & Campshure, 1990). In conducting such research, SIMNET facilities can be used to represent the family of DIS technologies in developing methodologies for evaluating DIS systems' potential performance enhancements to unit training of DoD forces.

To support design, development, fielding, and continuing improvement of training systems, new methodology is needed for evaluating their training effectiveness. Developing new evaluation methodology will require comprehensive information about various alternative training media mixes. The aim should be to relate the measured effectiveness of each media mix to the expected performance in a combat-like environment. Current training effectiveness evaluation methodologies typically use one-shot experiments. In this approach, the measured performance of the subject group represents a single point on the confounded learning curves of trainees and trainers as they adapt to the new system. Thus, traditional evaluation methodologies yield inadequate data for judging the true potential of complex training systems (Boldovici & Bessemer, 1994).

Learning curve theory (Hancock & Bayha, 1982) holds that as the number of training repetitions increases and feedback is provided, the proficiency level of the trainees improves--accuracy scores increase, performance speed increases, etc. The learning curve consists of two components, one related to the trainee as he/she performs the function of interest, and the other related to the experience of the trainer(s)

in administering the training process. According to the theory, each doubling of the number of training repetitions results in performance improvement by some fixed percentage. The rate of overall improvement is a function of the rates at which the individual trainees increase their proficiency levels. In quantifying the learning curve, performance data must be collected at several points during the course of training with new or conventional training systems (see Hiller, McFann, & Lehowicz, 1990). The best opportunity for acquiring such data will be from unit training conducted in SIMNET.

In the mid-1980's the Army began developing training management and assessment systems capitalizing on micro-computer technology. The Integrated Training Management System (ITMS; see Madden 1989) was developed to assist unit trainers in planning their training activities, documenting resource utilization, and tracking unit performance. The ITMS evolved into the Standard Army Training System (SATS; see US Army, 1989), currently in it's fourth generation. A large number of Mission Training Plans (MTPs) have been digitized for use in this system. ARI is currently developing the Combined Arms Training Strategies (CATS) to support annual training schedules and provide concrete guidance on preferred training methods and training progression. The CATS will include a matrix with ratings of quality training and cost factors for each training method (UCOFT, SIMNET, field, etc.) for each ARTEP task. On the performance assessment side, the National Training Center (NTC) implemented a performance data base incorporating input from instrumented ranges. With a focus on the SIMNET training environment, ARI developed the Unit Performance Assessment System (UPAS) for use by trainers and researchers (Meliza & Tan, in preparation; Meliza, Tan, White, Gross, & McMeel, in preparation; Schlechter, Bessemer, Rowatt & Nesselroade, in preparation).

In support of expanding training management and assessment needs, several recent Army initiatives are notable. ARI's Improved Program for Combined Arms Training (IPCAT) is developing a prototype training strategy to meet modern Army training requirements. A key part of this program is the analysis of Critical Combat Functions (CCFs; see Harrison, 1993) to organize the large number of MTP tasks, thereby facilitating more efficient and more effective training operations. The Electronic Collection Instrument (ECI) project is developing electronic clipboards to enhance the capability of unit and training personnel to capture observations of task performance during execution of training exercises. Tests using electronic clipboards incorporated CCFs as a special user option and were able to export and import data. In the DIS training environment known as the Close Combat Tactical Trainer (CCTT), the Army is developing a performance database along with the Standard Army Training System-Training Exercise Development System (SATS-TREDS) to support unit planning. The Simulation-Based Multiechelon Training for Armor Units (SIMUTA) program has produced an extensive training package for combined arms units using a variety of simulation tools. Incorporating CCFs, the package provides a library of more than a hundred exercises for platoon, company, and battalion training assessment. A follow-on effort, the Simulation-Based Mounted Brigade Training (SIMBART) program, extended the training package to the brigade level. Finally, ARI has established a CTC Archive to capture and store unit performance data collected during unit training at the various CTCs. Data from the CTC Archive have been used to statistically profile performance of units completing NTC rotations.

1.2 Statement of Problem

The current training assessment and management systems in use in the Army do not fully meet the needs of the modern training environment. Trainers using SIMNET facilities as part of their training program lack quantitative tools for assessing their unit's performance in the DIS environment. Given units' unique training needs and varying availability of resources, training managers find it difficult to compare and select alternative training methods. Considering the various performance assessment systems, including innovative tools such as electronic clipboards, the limited compatibility between systems is problematic. Likewise, the lack of a central forum for integrating all training performance data is troublesome. In addition, the limited ability to support research analysis of training effectiveness data hinders efforts to improve training systems and deprives decision makers of fully realistic information.

The need for a comprehensive, integrated training effectiveness data base and training management system has become more and more apparent. Trainers conducting SIMNET training exercises need quantitative assessment tools for quick-response support of AARs and take home packages. The intelligent use of comparable performance data obtained in home station, training area, SIMNET, and CTC training exercises is essential to units' planning and execution of successful training programs. For a comprehensive data base, the ability to easily input data from innovative platforms such as UPAS and electronic clipboards is important. Training managers need tools to help them realistically select alternative training methods, based on expected quality of training and relative cost. Finally, the means to facilitate extraction of data for decision-making and research purposes is an important requirement.

1.3 Scope

This project focuses on realizing a near-term practical impact on the training environment in USAREUR, through efforts to complement current training assessment procedures. By installing new SIMNET-based tools and integrating performance data from home station/training area, SIMNET, and CMTC arenas, the effort is designed to benefit trainers, researchers, training managers, and training developers. The new tools and data base are intended to provide a more objective basis for assessing unit training performance, which will enable greater standardization within the USAREUR training community. The project's scope encompasses initialization efforts extending into FY96, resulting in a foundation to sustain continuing operations as future resources become available. Ultimately the project's benefits can be expected to result in more effective USAREUR training programs, and consequently enhanced combat readiness of USAREUR forces.

1.4 Integrated Database

The integrated database provides a repository for the data collected during the earlier stages of the project, and consists of a number of related tables in a single Access® database. The database has not been fully populated with the entire set of data collected for the project, but has been loaded with a subset of the data sufficient to build the relationships among the different data types and demonstrate the functionality.

2.0 DIAGRAM OF SYSTEM COMPONENTS

The Integrated Database (IDB) system contains the components shown on Figure 1.

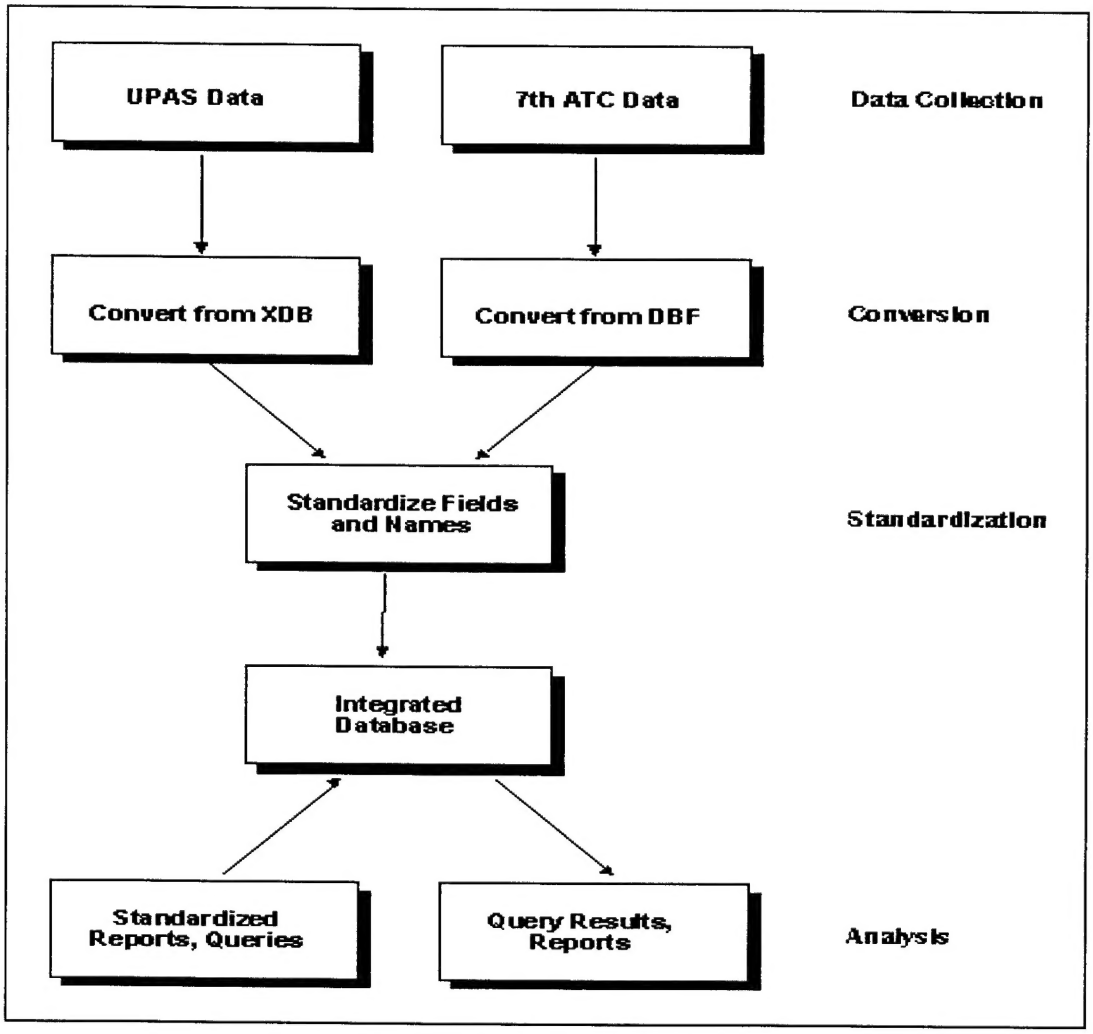

Figure 1. Database System Components

The **Data Collection** component provides the data which form the basis for the central database. The **Conversion and Loading** component transforms the collected data from the transfer format and medium into Microsoft Access® tables. The **Standardization** component resolves inconsistencies in field names and measurement units between/among different data sources. The **Analysis** component uses the integrated database to provide answers to questions that may be posed based on the loaded data. Each of the components is discussed in more detail in succeeding sections.

3.0 DESCRIPTION OF SYSTEM COMPONENTS AND INTERACTIONS

The IDB consists of a series of components which are used to build, maintain, and access the central database. Each component is discussed below.

3.1 Data Collection

Data collection is accomplished at a SIMNET training facility, Combat Training Center (CTC), or at another kind of training facility. Data may be collected and stored in a variety of formats and media. Within the bounds of the current database are data originally stored in three entirely different formats:

UPAS data are derived from SIMNET exercises by the UPAS software and are stored in the XDB database format, as a series of relational database tables. The data are archived from the XDB database to cartridge tape for storage and transport.

Gunnery Table data from the 7th ATC are entered into Dbase formatted tables and written to floppy disk for archival storage and transport.

UCOFT (Unit Conduct of Fire Trainer) data from the 7th ATC are entered into a computer system, them disseminated by means of computer-generated listings.

3.2 Data Conversion and Loading

Data conversion and loading can take many forms, including direct computer-based translation from one database system to another, creation of computer files in an intermediate form, which can be created by one system and read by another, even though no direct conversion capability exists, and complete or selective data entry, either directly into a database by means of specially designed input forms, or by means of formatted ASCII files which can be easily converted to a database format. Data for the IDB are handled in three different means.

UPAS data are written, table by table, to export files by means of the XDB software. These export files may then be converted to MS Access® tables by means of the Access® software. The concept is shown in Figure 2.

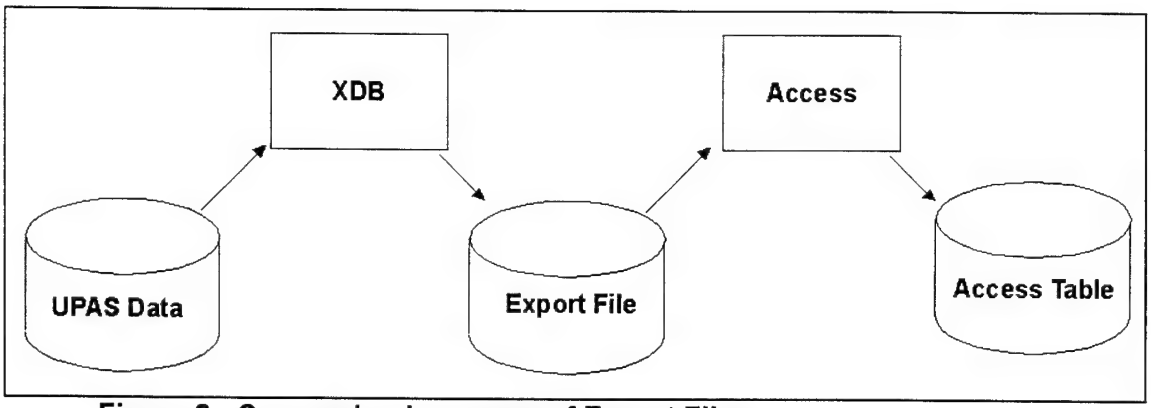

Figure 2 - Conversion by means of Export Files

Gunnery Table data, which are received in Dbase format (.DBF files) may be directly imported into MS Access®, providing an example of direct computer-based translation.

UCOFT data are received in the form of computer listings. In order to be useful in the integrated database, they must be manually entered. Input screens have been designed to accommodate this job and are shown as Figures 2 and 3.

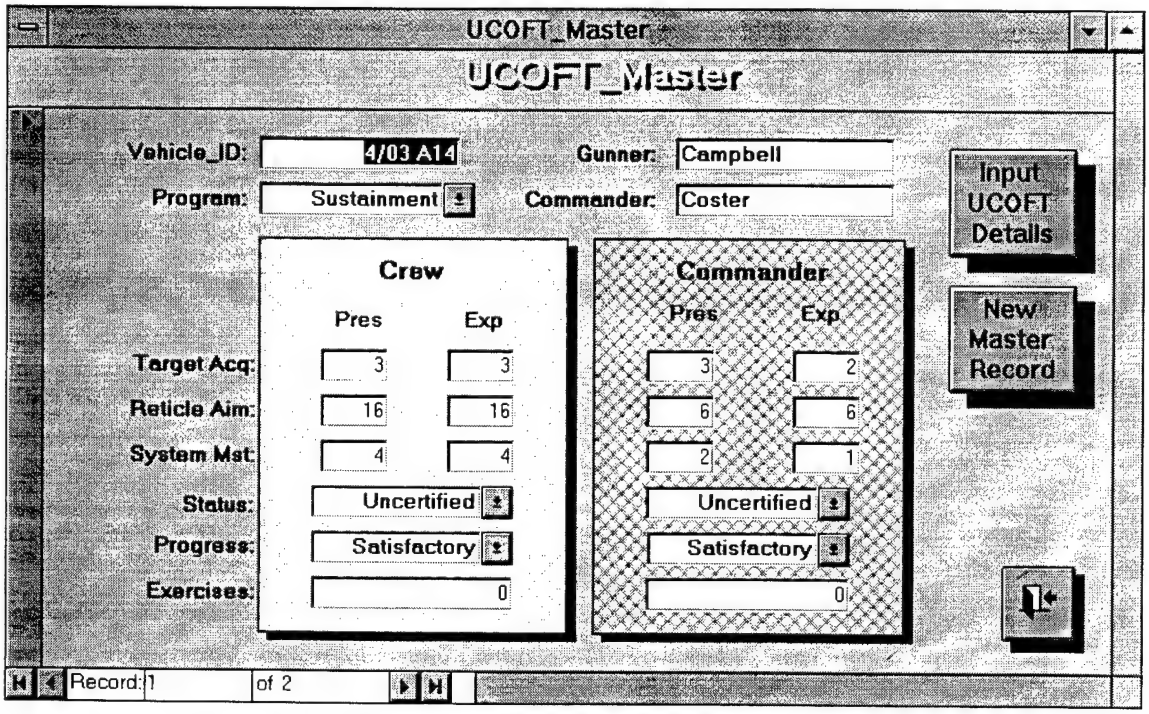

Figure 3 - UCOFT Master Data Input Screen

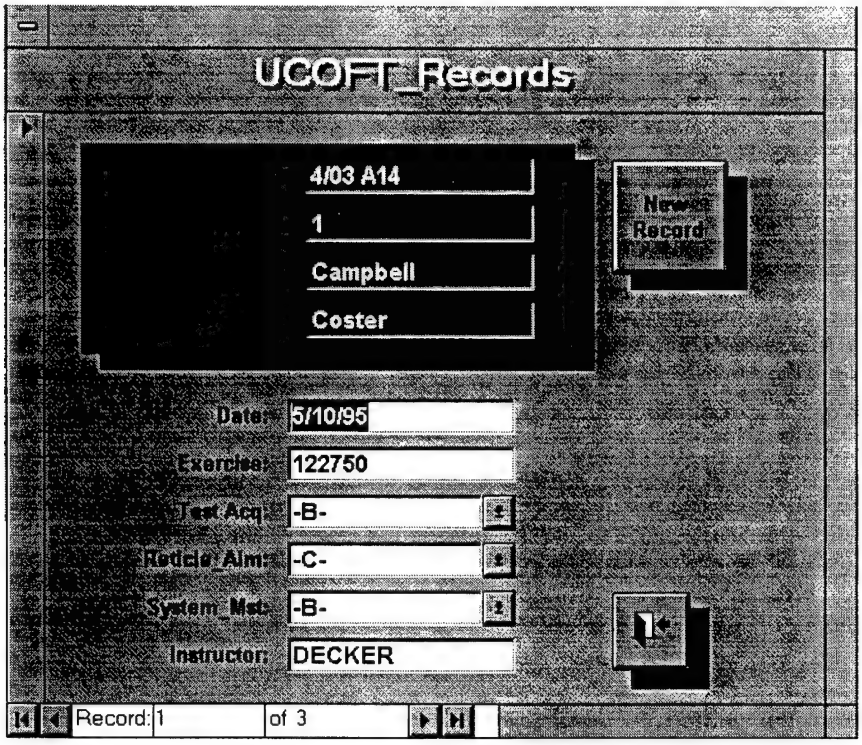

Figure 4 - UCOFT Training Records Input Screen

3.3 Data Standardization

Once the data have been loaded into the IDB, the field names and data in the various tables must be standardized so that the relationships among different tables may be forged. Standardization may take several forms:

Unit Changes When two fields in different tables contain the same data, but in different units, then the two fields have to be standardized by making them consistent. Most often this is done by changing one to match the other, but the process may also be accomplished by changing both fields to a "common denominator" unit. For example, if one field has distance measurements in feet and another field uses miles, the units (data) in one field could be changed to match the other, or both could be changed to kilometers, or meters.

Data Consolidation When the data in two tables which should be related are there, but aggregated into one field in one table and broken apart into separate fields in the other table, then the most straightforward way of making the tables relational is to consolidate the data stored in separate fields in the second table into one field. Within the IDB, for example, are several tables containing specifications of US Army units. In some tables, the unit is specified by

concatenating the division, brigade, battalion, company, and platoon into one string, while in others, there is a separate field for each echelon. Specifically, in the gunnery tables, tables B8, B8G, and T8 were modified into tables B8X, B8GX, and T8X, respectively with the addition of a new field which consolidated all echelon information.

Formatting

Another form of data standardization consists of straightforward formatting changes. This is most often needed with simple text fields. One good example would be telephone numbers. Some databases always carry phone numbers as (NNN) NNN-NNNN, while others eliminate the punctuation entirely: NNNNNNNNNN. In order to easily relate two tables based on a phone number, one format has to be used.

3.4 Analysis

The IDB (Access® database IDB.MDB) is fully relational in that any field in any table may be related to one or more fields in any other table. A description of the tables in the IDB is included as Appendix A to this document. Within the Access® environment, analysis products may be produced from the database in two similar methods.

One method uses the MS-Access® Query Builder to produce results directly from one or more tables. Two examples of queries are included below. The second method uses a query in conjunction with a report built with the MS-Access® report writer. The basis for retrieving the data is the same in both cases - Structured Query Language (SQL) code created by the Query Builder. An example of Query Builder use is shown below.

A query may be formulated which asks for specific information from one or more tables, based on conditions which are a part of the query. As a simple example, the following query asks for the unit designation and score for all units which have a unit designation (Not B8X.UNIT="blank") and scored a perfect 1000 (B8X.FSCORE=1000) on the Bradley Table 8.

```
SELECT DISTINCTROW B8X.UNIT, B8X.FSCORE
FROM B8X
WHERE ((Not B8X.UNIT="blank") AND (B8X.FSCORE=1000));
```

The results yield 44 rows, as shown in Table 1 on the next page. This is an example of a single-table query.

The relational nature of the database appears only when more than 1 table is used in a query. The query below uses both table B8X and B8GX to return the date of the run and the ranks of the driver and gunner for scores of 1000.

```
SELECT DISTINCTROW B8X.UNIT, B8X.DATE,
B8X.FSCORE, B8GX.GRNK, B8GX.DRNK
FROM B8X INNER JOIN B8GX ON (B8X.DATE =
B8GX.DDATE) AND (B8X.UNIT = B8GX.UNIT)
WHERE ((B8X.UNIT<>"blank") AND
(B8X.FSCORE=1000))
ORDER BY B8X.DATE;
```

An abbreviated sample of the output from the second query is shown as Table 2 below.

Table 2. Multiple-Table Query

1AD/2/312/D/1	23-Sep-94	1000	E4	E3
1AD/2/312/D/1	23-Sep-94	1000	E3	E4
1AD/2/312/D/3	24-Sep-94	1000	E5	E3
1AD/2/312/A/5	24-Sep-94	1000	E6	E4
1AD/2/312/B/3	28-Sep-94	1000	E4	E3
1AD/2/312/H/5	29-Sep-94	1000	E5	E4
1AD/2/312/B/5	29-Sep-94	1000	E4	E3

Both queries presented above were formulated using the Query Builder, which allows the database user to create sophisticated queries without having to write SQL. Figures 5, 6 and 7 illustrate the use of the Query Builder.

Figure 5 shows the initial screen encountered when the Query Builder is started. It asks the user to specify which table(s) will be used in the query. The user may select desired tables one by one, or mark multiple tables as shown on the figure. When the user is satisfied with the table selection, the "Add Table" dialog box may be closed.

Table 1. Single-Table Query

UNIT	FSCORE
1AD/4/11/B/1	1000
1AD/4/11/B/1	1000
1AD/4/11/B/3	1000
1AD/4/11/B/3	1000
1AD/4/11/C/1	1000
1AD/2/312/A/1	1000
1AD/2/312/A/3	1000
1AD/2/312/A/5	1000
1AD/2/312/B/3	1000
1AD/2/312/B/5	1000
1AD/2/312/D/1	1000
1AD/2/312/D/3	1000
1AD/2/312/H/5	1000
1AD/2/412/A/2	1000
1AD/2/412/B/2	1000
1AD/2/412/B/3	1000
1AD/2/412/C/3	1000
1AD/2/412/D/2	1000
3ID/1/115/A/1	1000
3ID/1/115/A/1	1000
3ID/1/115/A/2	1000
3ID/1/115/A/2	1000
3ID/1/115/A/2	1000
3ID/1/115/D/1	1000
3ID/1/115/D/1	1000
3ID/1/115/D/3	1000
3ID/1/115/D/5	1000
3ID/1/115/H/5	1000
3ID/3/16/A/2	1000
3ID/1/215/A/3	1000
3ID/1/215/B/1	1000
3ID/1/215/B/5	1000
3ID/1/215/C/3	1000
3ID/1/215/H/5	1000
3ID/4/34/A/3	1000
3ID/4/34/A/3	1000
3ID/4/34/H/5	1000
1AD/2/412/A/2	1000
1AD/2/412/B/2	1000
1AD/2/412/B/3	1000
1AD/2/412/C/3	1000
1AD/2/412/D/2	1000
3ID/4/43/A/1	1000
3ID/4/43/A/2	1000

The screen then looks like Figure 6, with the tables and their fields shown on the top part of the screen. The user next specifies the relationships between/among the tables selected. This is done simply by selecting (clicking on) a field in one table, and dragging it to the related field in another table. A line is drawn between related records in the different tables. In the example, we can see that the UNIT field in the B8X table is related to the UNIT field in the B8GX table. It is not necessary that fields have the same, or even similar names; what is important is the type and format of the data within the

fields. A second line shows the relationship between DDATE in table B8X and a field off the screen in table B8GX. This connects the date fields in the two tables. The next step is the specification of the field(s) which will either be displayed in the output or used in the logic. This is done by clicking on a field name in either table, and dragging it down to the Field line in the matrix below. Figure 7 shows that we have select UNIT, DDATE, SCORE and BRNK. An X in the Show line signifies that the field will be displayed on the output (or sent to the report), and is set by clicking on the box. Finally, the criteria which will be used to access the database are entered on the Criteria line below the field to which the criteria apply. For the example, we see that in the criteria row for BRNK, we have **Like "O?"**, which means that any rank which has O for the first character and any characters subsequently (? is a wild card) will meet the criteria. Likewise, the criteria row for FSCORE reads **> 950** signifying that any FSCORE greater than 950 will match the criteria. Putting the criteria together, we are looking for officers who scored over 950. As we are building the query as described above, Access® is building the SQL code which will actually be applied to the database. It is show below:

SELECT DISTINCTROW B8GX.UNIT, B8GX.DDATE, B8X.FSCORE, B8GX.BRNK FROM B8GX INNER JOIN B8X ON (B8GX.DDATE = B8X.DATE) AND (B8GX.UNIT = B8X.UNIT) WHERE ((B8X.FSCORE>950) AND (B8GX.BRNK Like "O?"));

This is the query used as the basis for the report shown in Table 3 below.

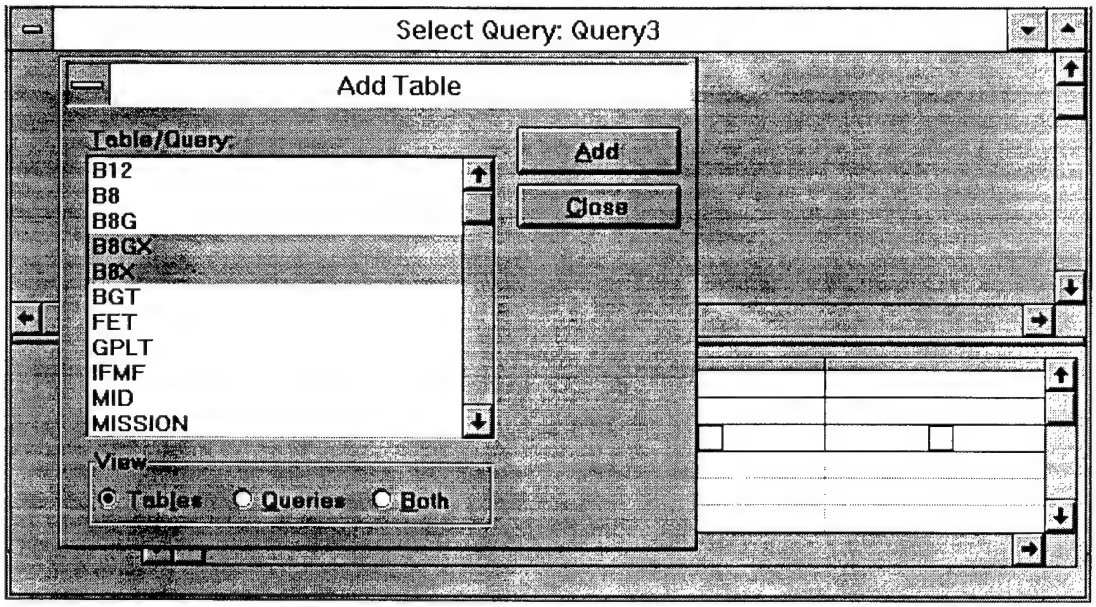

Figure 5. Initial Query Builder Screen

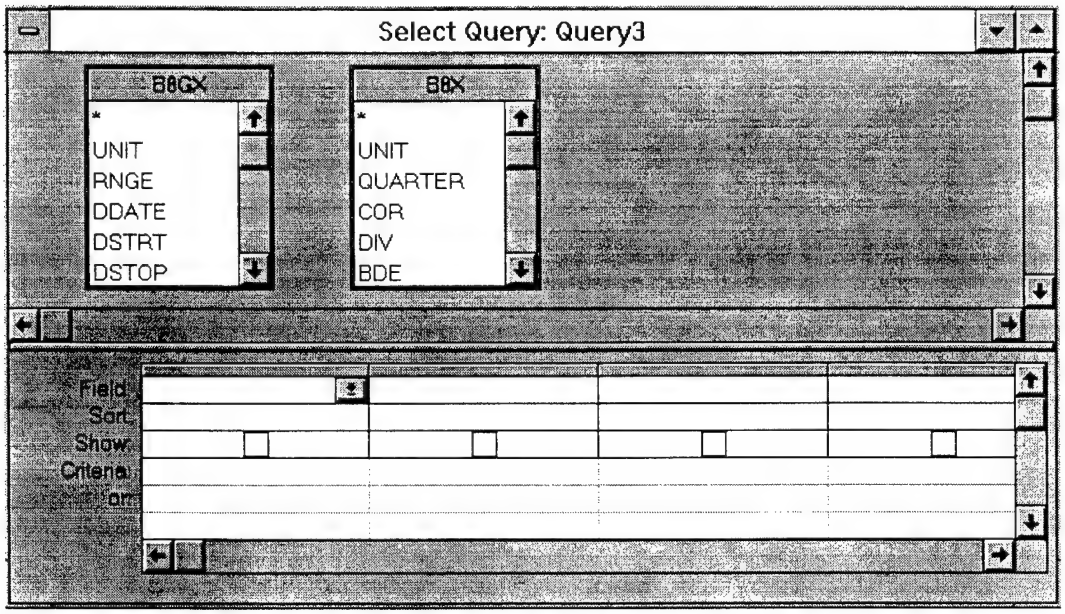

Figure 6. Second Query Builder Screen

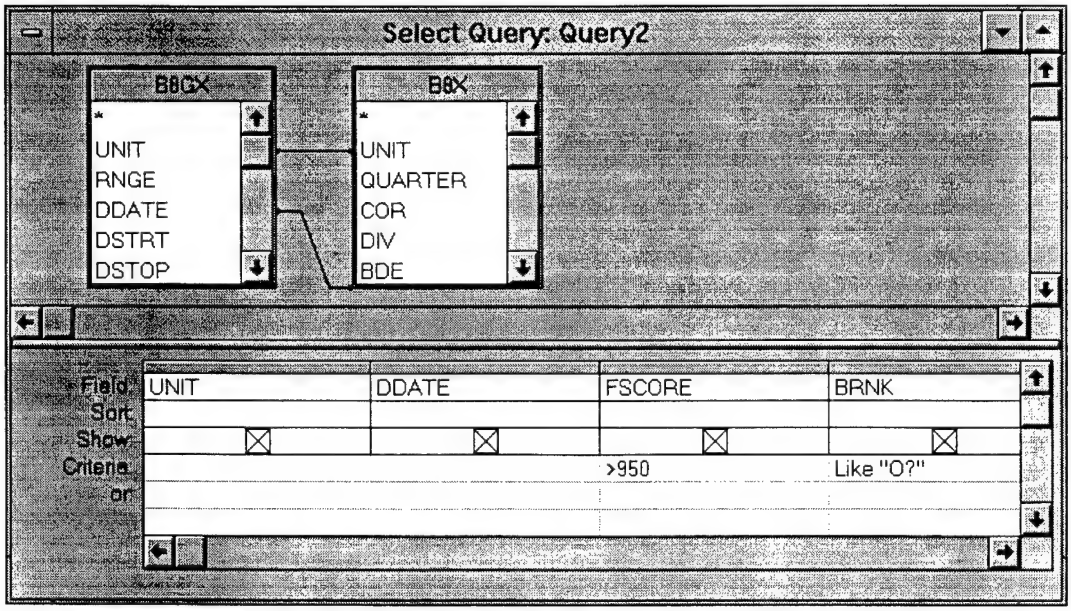

Figure 7. Third Query Builder Screen

The second way to produce analysis results is by means of an Access® report. A report is similar to a query in that a query is always the report's basis. The advantage of a report is the expanded formatting capabilities which are available. The query underlying a report may be as simple or as complicated as the analyst desires. The output below uses the two-table query demonstrated above to return the scores of officer-commanders with Bradley Table 8 scores over 950.

Queries can answer simple or straightforward questions directly. More complex questions involving advanced statistical methods will require initial queries, the output of which will be exported to a format compatible with more robust statistical packages, such as SPSS.

Table 3. Two-Table Access® Report

Officer Performance

03-Apr-96

UNIT	DDATE	FSCORE	BRNK
1AD/2/312/D/1	9/23/94	1000	O2
1AD/2/312/D/3	9/23/94	995	O1
1AD/2/312/A/5	9/24/94	1000	O3
1AD/2/312/C/5	9/29/94	990	O3
1AD/2/312/B/5	9/29/94	1000	O2
1AD/2/312/H/5	9/29/94	1000	O4
1AD/2/312/C/5	9/30/94	964	O2
1AD/2/412/C/1	10/7/94	962	O2
1AD/2/412/C/1	10/7/94	963	O2
1AD/2/412/C/1	10/7/94	963	O2
1AD/2/412/C/1	10/7/94	962	O2
1AD/2/412/D/2	10/12/94	1000	O1
1AD/2/412/D/2	10/12/94	1000	O1
1AD/4/11/C/1	10/21/94	1000	O2
1AD/4/11/A/1	10/25/94	977	O2
1AD/4/11/B/3	10/27/94	1000	O2
1AD/4/11/B/3	10/27/94	1000	O2
1AD/4/11/B/1	10/27/94	1000	O2
1AD/4/11/B/1	10/27/94	1000	O2

4.0 DESCRIPTION OF SYSTEM CAPABILITIES

The capabilities of the IDB are extensive, depending upon the amount of data loaded and the capabilities of the analysts using the system.

The capabilities of the system depend upon several factors:

(1) The analyst's understanding of the raw data is an important factor in the use of the integrated database. It is critical that, before any conclusions are drawn concerning any of the data, that the analyst have a clear understanding of the conditions under which the data were collected, the measures of performance that were in effect at the time of data collection, and the basic relationships of the data sources. This is particularly critical when joining two or more tables.

(2) A basic understanding of relational database concepts is important. As the IDB is extended, a perceptive analyst might well develop additional point of connection between/among the tables containing data from different data sources. In addition, lack of understanding of the basic relation database concepts might lead to incorrect conclusions.

(3) The database is currently loaded with a "sample" set of data. Loading additional data will support drawing significant conclusions.

5.0 SYSTEM ASSEMBLY INSTRUCTIONS

Assembly of the IDB requires only two things:

(1) Installation of Microsoft Access® version 2.0. MS Access® runs under either MS Windows 3.1 or Windows for Workgroups 3.11. A recommended minimum configuration is a 486DX processor with a minimum of 8 MB of RAM.

(2) Loading of the MS Access® database (IDB.MDB) on an accessible (local or network) hard drive. Access® databases are self contained in one file with a .MDB extension. The one file contains the table definitions, the data, and any queries or reports which have been created. The current version of the database uses approximately 3.5 megabytes of disk space. Each additional UPAS exercise will consume an additional 2.5-3 megabytes of disk space on average. As additional data are loaded, performance will be slowed somewhat, due to increased disk activity.

6.0 SYSTEM OPERATING INSTRUCTIONS

(1) Start MS Access® 2.0 by clicking on the icon in either the MS Office® group or a separate MS Access group. 

(2) Open file IDB.MDB. This is the completely self-contained IDB, including all tables (structure and data), queries, and reports.

(3) Create and/or run reports and queries; browse individual tables. Access® has a very nice user interface, allowing the user to select which feature will be used, Table, Query, Form, Report, Macro, or Module, then to define a new one (New), Open an existing one to review the contents, or modify an existing one (Design). In the example below, the user could review the contents of Data Table by clicking on Open, could modify the structure of the table by clicking on Design, or could define a totally new table by clicking on New. This document does not pretend to be a tutorial on MS Access® features; a variety of publications are available.

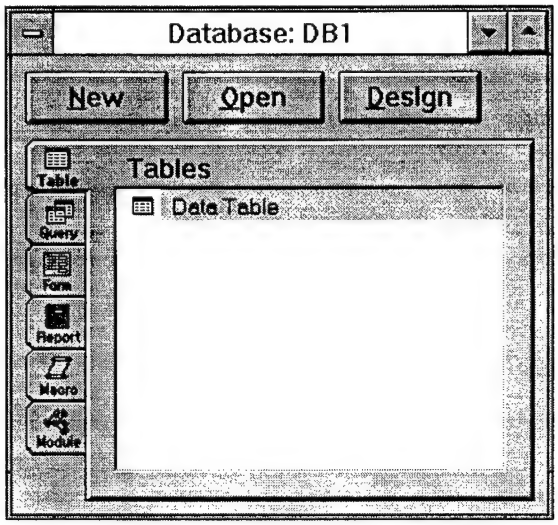

Figure 8. MS Access® Screen

7.0 SYSTEM TROUBLESHOOTING INSTRUCTIONS (ASSEMBLY AND OPERATION)

Microsoft Access®, as any Windows program, may occasionally cause a General Protection Fault. Experience has shown that data corruption occurs very infrequently. MS Access® does have a corrupted database fix option under the File menu.

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APPENDIX A

IDB TABLE LAYOUTS

IDB TABLE LAYOUTS

A.1 SUMMARY

Appendix A contains the layouts for the Microsoft Access® IDB Database. It is presented in three sections representing the three sources of data.

Section 1 contains the table layouts for the 7th ATC gunnery data:

Table Name	Definition
B12	Bradley Gunnery Table XII
B8GX	Bradley Gunnery Table VIII - Participants
B8X	Bradley Gunnery Table VIII
BGT	Precision Gunnery Table - Bradley
PGT	Precision Gunnery Table - Tank
T12	Tank Gunnery Table XII
T8G	Tank Gunnery Table VIII - Participants
T8X	Tank Gunnery Table VIII
TOW-95	TOW Gunnery Table

Section 2 contains the table layouts for the 7th ATC UCOFT data:

Table Name	Definition
UCOFT_MASTER	UCOFT Control Table
UCOFT_DATA	UCOFT Performance Data Table

Section 3 contains the UPAS exercise tables:

Table Name	Definition
FET	Firing Event Table
GPLT	Ground Position-Location Table
IFMF	Indirect Fire Mission Table
MID	Mission Identification Table
MISSION	Mission Description Table
MOP	Measures of Performance Table
PERFORM	Performance Tracking Table
PET	Pairing Event Table
PLTORG	Platoon Organization Table
PSIT	Player State Initialization Table
PSUT	Player State Update Table
PVWT	Player/Vehicle Weapon Table
TASK	Task Description Table
TEXT	MOP Summary Table
USIT	Unit State Update Table

A.2 7TH ATC GUNNERY TABLE DATA

Table: B12
Source: Gunnery Tables
Records: 59

Name	Type	Size
UNIT	Text	12
FY	Number (Double	8
QUARTER	Number (Byte)	1
PLSCR	Text	1
NUNQ	Number (Double	8
NQLF	Number (Double	8
NSPR	Number (Double	8
NDST	Number (Double	8
DTLSCR	Number (Double	8
DTLPRE	Number (Double	8
DMGSCR	Number (Double	8
DMGPRE	Number (Double	8
DTPSCR	Number (Double	8
DTPPRE	Number (Double	8
NTLSCR	Number (Double	8
NTLPRE	Number (Double	8
NMGSCR	Number (Double	8
NMGPRE	Number (Double	8
NTPSCR	Number (Double	8
NTPPRE	Number (Double	8
TLSCR	Number (Double	8
TLPRE	Number (Double	8
MGSCR	Number (Double	8
MGPRE	Number (Double	8
TPSCR	Number (Double	8
TPPRE	Number (Double	8

Table: **B8GX**
Source: **Gunnery Tables**
Records: **138**

Name	Type	Size
UNIT	Text	15
RNGE	Text	3
DDATE	Date/Time	8
DSTRT	Text	4
DSTOP	Text	4
DTAS	Number (Double	8
BSSN	Text	9
BRNK	Text	2
BNME	Text	3
BPOS	Number (Double	8
GSSN	Text	9
GRNK	Text	2
GNME	Text	3
GPOS	Number (Double	8
DSSN	Text	9
DRNK	Text	2
DNME	Text	3
DPOS	Number (Double	8
DEV	Text	3
NDATE	Date/Time	8
NSTRT	Text	4
NSTOP	Text	4
NTAS	Number (Double	8
NEV	Text	3
DWTHR1	Number (Double	8
DWTHR2	Number (Double	8
NWTHR1	Number (Double	8
NWTHR2	Number (Double	8
DTEMP	Number (Double	8
NTEMP	Number (Double	8
DVIS	Number (Double	8
NVIS	Number (Double	8
DTOW	Number (Double	8
NTOW	Number (Double	8
TYPE	Text	4
BUM	Text	3
PL	Text	1
CO	Text	1
BN	Text	3
BDE	Text	1
DIV	Text	5
COR	Text	1
STABLE	Number (Double	8

Table: **B8X**
Source: **Gunnery Tables**
Records: **367**

Name	Type	Size
UNIT	Text	15
QUARTER	Number (Byte)	1
COR	Text	1
DIV	Text	5
BDE	Text	1
BN	Text	3
CO	Text	1
PL	Text	1
BUM	Text	3
FY	Number (Double	8
BSCORE	Number (Double	8
BSTM	Number (Double	8
BSTC	Number (Double	8
BETM	Number (Double	8
BETC	Number (Double	8
BKTM	Number (Double	8
BKTC	Number (Double	8
BHITM	Number (Double	8
BHITC	Number (Double	8
B3BT	Number (Double	8
FSCORE	Number (Double	8
FSTM	Number (Double	8
FSTC	Number (Double	8
FETM	Number (Double	8
FETC	Number (Double	8
FKTM	Number (Double	8
FKTC	Number (Double	8
FHITM	Number (Double	8
FHITC	Number (Double	8
F3BT	Number (Double	8
DATE	Date/Time	8
QUAL	Text	1
STABLE	Number (Double	8

Table: **BGT**
Source: **Gunnery Tables**
Records: **357**

Name	Type	Size
UNIT	Text	5
DATE	Text	8
CNT	Number (Double	8
EX	Text	6
IT	Text	1
TIME	Text	4
VOPN_AVG	Number (Double	8
TOPN_AVG	Number (Double	8
OPNTMAVG	Number (Double	8
VKIL_AVG	Number (Double	8
TKIL_AVG	Number (Double	8
KILTMAVG	Number (Double	8
VEHXKILL	Number (Double	8
TRPXKILL	Number (Double	8
XKILL	Number (Double	8
EVPRES	Number (Double	8
EVKILL	Number (Double	8
EVEH_PER	Number (Double	8
TPRES	Number (Double	8
TKILL	Number (Double	8
TKIL_PER	Number (Double	8
FRNDPRES	Number (Double	8
FRATS	Number (Double	8
FRAT_PER	Number (Double	8
NBC	Number (Double	8
DEGRADED	Number (Double	8
SCORE	Number (Double	8
QUAL	Text	1

Table: **PGT**
Source: **Gunnery Tables**
Records: **511**

Name	Type	Size
UNIT	Text	5
DATE	Text	8
CNT	Number (Double	8
EX	Text	6
IT	Text	1
TIME	Text	4
VOPN_AVG	Number (Double	8
TOPN_AVG	Number (Double	8
OPNTMAVG	Number (Double	8
VKIL_AVG	Number (Double	8
TKIL_AVG	Number (Double	8
KILTMAVG	Number (Double	8
VEHXKILL	Number (Double	8
TRPXKILL	Number (Double	8
XKILL	Number (Double	8
EVPRES	Number (Double	8
EVKILL	Number (Double	8
EVEH_PER	Number (Double	8
TPRES	Number (Double	8
TKILL	Number (Double	8
TKIL_PER	Number (Double	8
FRNDPRES	Number (Double	8
FRATS	Number (Double	8
FRAT_PER	Number (Double	8
NBC	Number (Double	8
DEGRADED	Number (Double	8
SCORE	Number (Double	8
QUAL	Text	1

Table: T12
Source: Gunnery Tables
Records: 77

Name	Type	Size
UNIT	Text	12
FY	Number (Double	8
QUARTER	Number (Byte)	1
PLSCR	Text	1
NUNQ	Number (Double	8
NQLF	Number (Double	8
NSPR	Number (Double	8
NDST	Number (Double	8
DTLSCR	Number (Double	8
DTLPRE	Number (Double	8
DMGSCR	Number (Double	8
DMGPRE	Number (Double	8
DTPPRE	Number (Double	8
DAMMO	Number (Double	8
NTLSCR	Number (Double	8
NTLPRE	Number (Double	8
NMGSCR	Number (Double	8
NMGPRE	Number (Double	8
NTPPRE	Number (Double	8
NAMMO	Number (Double	8
TLSCR	Number (Double	8
TLPRE	Number (Double	8
MGSCR	Number (Double	8
MGPRE	Number (Double	8
TPPRE	Number (Double	8
TAMMO	Number (Double	8

Table: **T8G**
Source: **Gunnery Tables**
Records: **186**

Name	Type	Size
DDTE	Date/Time	8
DSTRT	Text	4
DSTOP	Text	4
TSSN	Text	9
TRNK	Text	2
TNME	Text	3
TPOS	Number (Double	8
GSSN	Text	9
GRNK	Text	2
GNME	Text	3
GPOS	Number (Double	8
LSSN	Text	9
LRNK	Text	2
LNME	Text	3
LPOS	Number (Double	8
DSSN	Text	9
DRNK	Text	2
DNME	Text	3
DPOS	Number (Double	8
DEV	Text	3
DRNG	Text	3
NDTE	Date/Time	8
NSTRT	Text	4
NSTOP	Text	4
NEV	Text	3
NRNG	Text	3
UNITA	Text	10
UNITB	Text	5
TNK	Number (Double	8
WET1	Number (Double	8
WET2	Number (Double	8
WET3	Number (Double	8
WET4	Number (Double	8
TEMP	Number (Double	8
TEMP1	Number (Double	8
DVIS	Number (Double	8
NVIS	Number (Double	8
STABLE	Number (Double	8

Table: **T8X**
Source: **Gunnery Tables**
Records: **348**

Name	Type	Size
UNIT	Type	12
FY	Number (Double	8
QUARTER	Number (Byte)	1
BFRH	Number (Double	8
BRNDS	Number (Double	8
BSCORE	Number (Double	8
BOTIME	Number (Double	8
BTME	Number (Double	8
BHITS	Number (Double	8
BMGHITS	Number (Double	8
BMGTME	Number (Double	8
BA3OT	Number (Double	8
BA3SCR	Number (Double	8
FFRH	Number (Double	8
FRNDS	Number (Double	8
FSCORE	Number (Double	8
FOTIME	Number (Double	8
FTME	Number (Double	8
FHITS	Number (Double	8
FMGHITS	Number (Double	8
FMGTME	Number (Double	8
FA3OT	Number (Double	8
FA3SCR	Number (Double	8
DATE	Date/Time	8
QUAL	Text	1
STABLE	Number (Double	8

Table: **TOW-95**
Source: **Gunnery Tables**
Records: **112**

Name	Type	Size
COR	Number (Double	8
DIV	Text	5
BAT	Text	5
CO	Text	1
SN	Number (Double	8
POST	Number (Double	8
MOUNT	Number (Double	8
DATE	Date/Time	8
FY	Number (Double	8
EXP	Number (Double	8
WTH	Number (Double	8
TEMP	Number (Double	8
LIGHT	Number (Double	8
TYP	Number (Double	8
RNG	Number (Double	8
HIT	Number (Double	8
CAUSE	Number (Double	8
ALT	Number (Double	8
SPD	Number (Double	8
LOT	Text	8

A.3 7TH ATC UCOFT DATA

Table: UCOFT_Master
Source: Listings of UCOFT Results
Records: 0

Name	Type	Size
Vehicle_ID	Text	10
Program_Code	Number (Intege	2
Commander	Text	20
Gunner	Text	20
Crew_Pres_Target_Acq	Number (Intege	2
Crew_Exp_Target_Acq	Number (Intege	2
Crew_Pres_Reticle_Aim	Number (Intege	2
Crew_Exp_reticle_Aim	Number (Intege	2
Crew_Pres_System_Mst	Number (Intege	2
Crew_Exp_System_Mst	Number (Intege	2
Crew_Status_Cd	Number (Intege	2
Crew_Progress_Cd	Number (Intege	2
Crew_Exercises	Number (Intege	2
Cmdr_Pres_Target_Acq	Number (Intege	2
Cmdr_Exp_Target_Acq	Number (Intege	2
Cmdr_Pres_Reticle_Aim	Number (Intege	2
Cmdr_Exp_reticle_Aim	Number (Intege	2
Cmdr_Pres_System_Mst	Number (Intege	2
Cmdr_Exp_System_Mst	Number (Intege	2
Cmdr_Status_Cd	Number (Intege	2
Cmdr_Progress_Cd	Number (Intege	2
Cmdr_Exercises	Number (Intege	2

Table: UCOFT_Records
Source: Listings of UCOFT Results
Records: 0

Name	Type	Size
Vehicle_ID	Text	10
Program_Code	Number (Intege	2
Commander	Text	20
Gunner	Text	20
Date	Date/Time	8
Exercise	Text	6
Test_Acq	Text	6
Reticle_Aim	Text	6
System_Mst	Text	6
Instructor	Text	24

A.4 UPAS DATA

Table: FET
Source: UPAS Data
Records: 6611

Name	Type	Size
TTIME	Text	8
PID	Text	11
LPN	Text	17
WPN	Text	8
X	Text	7
Y	Text	7
AMMO	Text	8
NROUNDS	Number (Double	8
EVENT_NO	Number (Double	8

Table: GPLT
Source: UPAS Data
Records: 4028

Name	Type	Size
TTIME	Text	8
PLPID	Text	11
PLLPN	Text	17
X	Text	7
Y	Text	7
Z	Number (Double	8
REL_X	Number (Double	8
REL_Y	Number (Double	8
VSPEED	Text	4
VDIR	Text	6
GELEV	Text	6
TAZM	Text	6
ESPEED	Text	5
DISTANCE	Text	4
AMMO	Text	5
FUEL	Text	5

Table: IFMF
Source: UPAS Data
Records: 412

Name	Type	Size
TTIME	Text	8
IFMISS	Text	6
IFFORCE	Text	1
IFBAT	Text	17
IFTARG	Text	6
IFTX	Text	7
IFTY	Text	7
IFWT	Text	8
IFST	Text	8
IFFT	Text	8
NROUNDS	Text	4

Table: MID
Source: UPAS Data
Records: 1

Name	Type	Size
MSTART	Text	8
MEND	Text	8
MHISTORY	Text	11
MSEGMENT	Text	4
MTYPE	Text	21
MORG	Text	21
MTF	Text	2

Table: MISSION
Source: UPAS Data
Records: 56

Name	Type	Size
M_NAME	Text	30
PHASE	Text	30
PRIORITYP	Number (Double	8
SUB_PHASE	Text	30
PRIORITYS	Number (Double	8
T_NAME	Text	50
T_NUMBER	Number (Double	8
PRIORITY	Number (Double	8

Table: **MOP**
Source: **UPAS Data**
Records: **155**

Name	Type	Size
M_NAME	Text	30
T_NUMBER	Number (Double	8
P_INDEX	Number (Double	8
PRIORITY	Number (Double	8
MOP_KIND	Text	14
MOP_DSP_FO	Text	14
SQL_NAME	Text	40
MOP_STATEM	Text	200

Table: **PERFORM**
Source: **UPAS Data**
Records: **107**

Name	Type	Size
M_NAME	Text	30
T_NUMBER	Number (Double	8
P_INDEX	Number (Double	8
PERFORMANC	Text	200

Table: **PET**
Source: **UPAS Data**
Records: **6903**

Name	Type	Size
TTIME	Text	8
TPID	Text	11
TLPN	Text	17
RESULT	Text	1
FPID	Text	11
FLPN	Text	17
FWPN	Text	8
FAMMO	Text	8
FRAT	Text	1
TX	Text	7
TY	Text	7
FX	Text	7
FY	Text	7
RANGE	Number (Double	8
EVENT_NO	Number (Double	8
NROUNDS	Number (Double	8

Table: PLTORG
Source: UPAS Data
Records: 24

Name	Type	Size
COMPCODE	Text	3
PLTCODE	Text	1
ORGCODE	Text	6
PLLPN	Text	17
PTYPE	Text	1
COMPANY	Text	18
PLATOON	Text	18
SIDE	Text	1
PID	Text	11

Table: PSIT
Source: UPAS Data
Records: 281

Name	Type	Size
PID	Text	11
LPN	Text	17
SIDE	Text	1
INST	Text	1
PTYPE	Text	10
ORG	Text	80
TRACK	Text	1
PSTAT	Text	1

Table: PSUT
Source: UPAS Data
Records: 274

Name	Type	Size
TTIME	Text	8
PID	Text	11
LPN	Text	17
SIDE	Text	1
INST	Text	1
PTYPE	Text	8
ORG	Text	80
TRACK	Text	1
PSTAT	Text	2

Table: PVWT
Source: UPAS Data
Records: 206

Name	Type	Size
PSIDE	Text	1
PTYPE	Text	8
PVEH	Text	24
PMILES	Text	3
PWPN	Text	24
PAMMO	Text	8
COST	Text	8

Table: TASK
Source: UPAS Data
Records: 56

Name	Type	Size
M_NAME	Text	30
T_NUMBER	Number (Double	8
STANDARD	Text	200

Table: TEXT
Source: UPAS Data
Records: 199

Name	Type	Size
SQL_NAME	Text	40
FLD_NO	Number (Double	8
FLD_NAME	Text	20
T_TYPE	Text	1

Table: USIT
Source: UPAS Data
Records: 4

Name	Type	Size
UNIT	Text	80
LINU	Text	21
STAU	Text	21
UTYPE	Text	4
UFORCE	Text	1
UECH	Text	4